

or are only available in certain locations or for certain age classes and were therefore not examined in this report. Landings data may not always reflect actual population densities of a given species, but can provide a reasonable estimate of the state of the fishery when considering socioeconomic factors.

Introduction to Time Series Analysis

The ability to quantify the impacts of man-induced or natural interventions on a fishery provides decision makers with information that allows for more effective resource management. Understanding how past interventions have affected a particular fishery can help managers anticipate changes that may occur should a similar event occur in the future. Intervention analysis, a type of time series analysis, is a statistical technique used to detect nonrandom changes in the mean level of a time series that may have been caused by a particular event (e.g., hurricane, regulations, etc.). The analysis answers the question: was there a significant reduction or increase in landings, and if so, what was the magnitude?

Intervention analysis can be used in the fisheries realm to detect changes resulting from a variety of external influential events such as hurricanes, red tide, pollution events, seafood market developments, and regulation changes. Carpenter (1990) suggests using intervention analysis for large-scale experiments when replication is impossible. Chan et al. (2003) states that intervention analysis provides a valuable tool for studying the impact of an environmental disturbance on a stable dynamic system. This technique is not familiar to most fishery biologists, because it is not typically taught as part of the curriculum in most fishery programs. Nonetheless, intervention analysis can give valuable insight into the effects that external influences have on a particular fishery of interest and can be used where a long time series of data is available prior to the intervention. Noakes (1986) illustrates the usefulness of intervention analysis in the management of fishery resources. Intervention analysis has been used successfully to detect changes in a wide variety of fisheries issues (Thompson et al. 1982; Noakes 1986; Noakes and Campbell 1992; Hare and Francis 1995; Pace et al. 1998; Lloret et al. 2000; Madenjian et al. 2000; Chan et al. 2003).